June 18, 1982

Part I

Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided on the answer sheet.

1. What is the multiplicative inverse of $\frac{1}{x}$? 1_____

2. Solve for x: $5(x - 4) = 10$ 2_____

3. What is the value of a^2b if $a = 2$ and $b = -3$? 3_____

4. Solve for c: $23 - 6c = 15 - 10c$ 4_____

5. Gayle is paid at a rate of \$3.80 per hour. Express in terms of k the number of dollars she earns for working k hours. 5_____

6. Factor: $4x^2 - 9$ 6_____

7. Solve for x in terms of b, m, and y: $y = mx + b$ 7_____

8. Jorge buys a television set for \$600. If the sales tax is 7%, find the sales tax in dollars. 8_____

9. Find the numerical value of $|9 - 3|$. 9_____

10. If the replacement set is {3,4,5,6}, find the solution set of the inequality $2y - 1 > 8$. 10_____

11. Solve for y: $\frac{3 + y}{7} = \frac{y - 9}{3}$ 11_____

12. What is the numerical value of $(\cos 60° + \sin 30°)$? 12_____

13. The area of a rectangle is represented by $x^2 + 5x$. If the width of the rectangle is x, express the length in terms of x. 13_____

14. Solve for x: $0.2x = 33$ 14_____

15. The measure of the vertex angle of an isosceles triangle is 50 degrees. What is the measure, in degrees, of each base angle? 15_____

16. A lighthouse on level ground casts a shadow 30 feet long at the same time that a 5-foot-tall person, standing near the lighthouse, casts a shadow 3 feet long. What is the number of feet in the height of the lighthouse? 16_____

17. Solve the following system of equations for x:

$$x + y = 7$$
$$2x - y = 5$$

17_____

18. Factor: $x^2 - 11x + 24$ 18_____

19. Express $\frac{x}{2} + \frac{x + 1}{5}$ as a single fraction in *simplest form.* 19_____

Directions (20-30): Write in the space provided on the answer sheet the *numeral* preceding the expression that best completes *each* statement or answers *each* question.

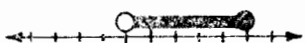
20. The product of $5x^3$ and $3x^2$ is (1) $15x^6$ (2) $15x^5$ (3) $8x^6$ (4) $8x^5$ 20____

21. If $A = \{1,2,3,4\}$, which set is *not* a subset of A? (1) {1} (2) { } (3) {0} (4) {1,2,3,4} 21____

22. The side of a square is $\sqrt{18}$. What is the area of the square? (1) 36 (2) 18 (3) 9 (4) $4\sqrt{18}$ 22____

23. Which graph represents the solution set of $-1 \leq x < 4$?

(1) 

(3) 

(2) 

(4) 

23____

24. What is the length of the hypotenuse of a right triangle whose legs have lengths 3 and 5? (1) $\sqrt{34}$ (2) $\sqrt{31}$ (3) $\sqrt{8}$ (4) 4 24____

25. The expression $4\sqrt{3} + 3\sqrt{27}$ is equivalent to (1) $7\sqrt{30}$ (2) $10\sqrt{3}$ (3) $13\sqrt{3}$ (4) 108 25____

26. A root of the equation $x^2 + 6x - 16 = 0$ is (1) 16 (2) -2 (3) 8 (4) -8 26____

27. What is the average of the numbers represented by $n + 3$, $2n - 1$, and $3n + 4$? (1) $\frac{5n + 6}{3}$ (2) $2n + 2$ (3) $3n + 3$ (4) $\frac{6n + 7}{3}$ 27____

28. The integers x and y for which $x < \sqrt{130} < y$ are (1) $x = 10$ and $y = 11$ (2) $x = 11$ and $y = 12$ (3) $x = 12$ and $y = 13$ (4) $x = 120$ and $y = 140$ 28____

29. What is 66.45 rounded to the *nearest integer*? (1) 66 (2) 66.5 (3) 67 (4) 70 29____

30. What are the coordinates of the point which lies on both axes of a rectangular coordinate system? (1) (0,0) (2) (0,1) (3) (1,0) (4) (1,1) 30____

Part II

Answer four questions from this part. Show all work unless otherwise directed.

31. *a* On the same set of coordinate axes, graph the lines whose equations are:
(1) $y = 2x + 1$ [3]
(2) $y = 1$ [2]
(3) $x = 2$ [2]

b Write the coordinates of the three vertices of the triangle formed by the lines graphed in part *a*. [3]

32. Answer *both a* and *b*.

a Find the solution set and check:

$$\frac{y+2}{3} - \frac{y+3}{4} = \frac{1}{2} \qquad [4, 2]$$

b Express as a single fraction in *lowest terms*:

$$\left(\frac{y^2 - 16}{2y + 6}\right)\left(\frac{y+3}{y-4}\right) \qquad [4]$$

33. Write an equation or a system of equations that can be used to solve *each* of the following problems. In *each* case, state what the variable or variables represent. [*Solution of the equations is not required.*]

a Water from the hot-water faucet can fill a bathtub in 6 minutes. When both faucets are open, it takes 4 minutes to fill the bathtub. How long would it take to fill the bathtub with water from the cold-water faucet alone? [5]

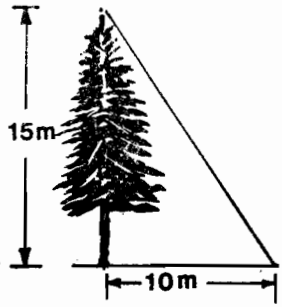
b The difference between two numbers is 9. If four times the larger number is ten times the smaller, what are the numbers? [5]

34. The denominator of a fraction is 8 more than the numerator. If 5 is added to both the numerator and the denominator, the result is equal to ½. Find the original fraction. [*Only an algebraic solution will be accepted.*] [5, 5]

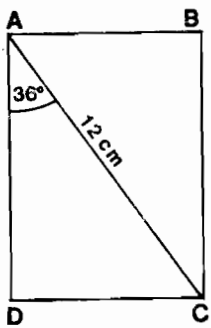
35. The width of a rectangle is 2 less than a side of a square, and the length is 1 more than a side of the square. If the area of the rectangle is 28, find the length of a side of the square. [*Only an algebraic solution will be accepted.*] [5, 5]

36. Answer *both* *a* and *b*.

a In the accompanying diagram, a tree 15 meters high casts a shadow 10 meters long. What is the angle of elevation of the Sun to the *nearest degree*? [5]



b In the accompanying figure, $ABCD$ is a rectangle, the length of diagonal $\overline{AC}$ is 12 centimeters, and angle CAD contains 36°. Find the length of side $\overline{AD}$ to the *nearest centimeter*. [5]



37. The replacement set for x for each of the open sentences listed below is $\{-2,-1,0,1,2\}$. *On your answer sheet,* write the letters *a* through *e*, and next to *each* write the solution set of *each* open sentence. [*Each answer must be a subset of the replacement set.*] [10]

a $3x + 4 < x + 2$ (*a*)_____

b $|x| = 2$ (*b*)_____

c $2x + 2 = 0$ (*c*)_____

d $3x = 1$ (*d*)_____

e $x^2 + 3x = 0$ (*e*)_____